ISSN: 3065-7628

Research Article

Journal of Future Medicine and Healthcare Innovation

Assessing Indigenous Knowledge for Diagnosis and Treatment of Horse Diseases and Developing a Knowledge-Based System: Evidence from East Wallaga and Horo Guduru Wallaga Zones, Ethiopia

Misgana Merga[1]*, Diriba Girma[2], Morka Amente[3] and Mebrate Dufera[4]

[1,2]*Department of Information Science, School of Informatics, Wollega University, Nekemte, Ethiopia*

[3]*School of Veterinary Medicine, Wollega University, Nekemte, Ethiopia*

[4]*Department of Biology, College of Natural and Computational Sciences, Wollega University, Nekemte, Ethiopia*

***Corresponding Author**
Misgana Merga, Department of Information Science, School of Informatics, Wollega University, Nekemte, Ethiopia.

Submitted: 2025, Aug 01; **Accepted:** 2025, Sep 08; **Published:** 2025, Sep 23

Citation: Merga, M., Girma, D., Amente, M., Dufera, M. (2025). Assessing Indigenous Knowledge for Diagnosis and Treatment of Horse Diseases and Developing a Knowledge-Based System: Evidence from East Wallaga and Horo Guduru Wallaga Zones, Ethiopia. *J Future Med Healthcare Innovation, 3*(2), 01-04.

Abstract

In Ethiopia, indigenous knowledge remains a vital pillar of equine healthcare, especially in rural areas where access to modern veterinary services is limited. This study documents, validates, and digitizes traditional diagnostic and treatment practices for horse diseases, culminating in the development of a knowledge-based system (KBS). A total of 86 informants, including traditional healers, horse owners, and veterinary officers, participated in semi-structured interviews, field observations, and document reviews. The collected knowledge was verified by veterinary experts and encoded into hierarchical models and production rules, implemented in a SWI-Prolog environment. The resulting system achieved an accuracy of 83%, sensitivity of 81%, and specificity of 85%, with an 83.4% acceptance rate among users. By formalizing indigenous veterinary practices into a digital expert system, this work demonstrates the potential of integrating traditional knowledge into modern animal healthcare to improve service delivery in underserved regions of Ethiopia.

Keywords: Indigenous Knowledge, Equine Health, Expert System, Veterinary Informatics and Knowledge-Based System

1. Introduction

Indigenous knowledge plays a critical role in animal health management within Ethiopia, particularly in rural communities where horses are indispensable to livelihoods. These animals provide essential services in transport, agriculture, and cultural activities. However, diseases such as epizootic lymphangitis, African horse sickness, and colic often threaten equine productivity and welfare. Modern veterinary services remain scarce, which has preserved the reliance on traditional remedies. This research addresses the gap between indigenous veterinary practices and modern technological solutions by creating a structured, digital knowledge-based system for disease diagnosis and treatment.

1.1. Statement of the Problem

Horses are integral to Ethiopia's rural livelihoods, underpinning transportation, agriculture, and socio-economic activities.

However, equine health management is constrained by the prevalence of debilitating diseases like epizootic lymphangitis and African horse sickness, compounded by scarce access to modern veterinary services. Indigenous knowledge (IK) remains the primary recourse for many communities, yet it is predominantly undocumented, fragmented, and at risk of erosion due to its oral transmission.

These disconnect between traditional veterinary wisdom and formal veterinary science limits the optimization of equine healthcare. Despite the critical role of IK, current veterinary systems largely overlook its integration, resulting in missed opportunities to enhance disease diagnosis and treatment outcomes. The absence of a systematic, technology-driven platform to capture and operationalize IK in Ethiopia's equine sector exacerbates this gap.

Developing an intelligent, rule-based knowledge-based system (KBS) offers a transformative approach to preserve, validate, and apply indigenous diagnostic and therapeutic practices alongside modern veterinary medicine. This study pioneers such integration, addressing the lack of tailored expert systems for equine diseases within Ethiopia by formalizing IK into a scalable, accessible digital tool for improved equine health management.

1.2. Objective of the Study

1.2.1. General Objectives of the Study

To assess indigenous knowledge for diagnosing and treating horse diseases and to develop a knowledge-based expert system tailored for East Wallaga and Horo Guduru Wallaga Zones.

1.2.2. Specific Objective of the Study

- To systematically document and encode indigenous diagnostic and treatment practices into a functional knowledge-based system.
- To critically evaluate traditional equine healthcare methods against modern veterinary standards.
- To design and implement a robust knowledge acquisition and rule-based modeling framework for the KBS.
- To validate the system's diagnostic accuracy, reliability, and user acceptability through expert and community assessments.

1.2.3. Outcomes

The developed knowledge-based system achieved a high diagnostic accuracy of 83%, sensitivity of 81%, and specificity of 85%, significantly surpassing the 67% accuracy of unaided traditional assessments. User acceptance was strong at 83.4%, reflecting the system's cultural relevance and usability. The platform's rapid response times and multilingual support further facilitate its adoption in diverse rural communities. By formalizing and preserving indigenous veterinary knowledge through an expert system, this study provides a scalable, effective tool that bridges traditional and modern veterinary care, improving equine health management in underserved regions of Ethiopia.

2. Related Work

Ethnoveterinary studies in Ethiopia (Yineger et al., 2007; Molla et al., 2021) have documented various medicinal plants and traditional treatment approaches for animal health [1,2]. While expert systems have been successfully applied in poultry health (Tesfaye & Belay, 2018) and human medical diagnostics (Siew et al., 2005), their application to equine diseases within Ethiopia has been minimal [3,4]. This research fills a critical gap by integrating indigenous equine healthcare knowledge with an artificial intelligence-driven diagnostic platform.

3. Methodology

The study followed the Design Science Research (DSR) methodology. A purposive sampling approach was used to select 86 participants, comprising 42 traditional healers, 28 horse owners, and 16 veterinary officers from East Wallaga and Horo Guduru Wallaga Zones. Data collection involved semi-structured interviews, direct observation of treatment procedures, and review of locally maintained veterinary records. Collected information was validated by three veterinary experts, with disagreements resolved through consensus discussions. Ethical clearance was obtained from Wallaga University Research Board, and informed consent was acquired from all participants. The validated knowledge was structured into decision trees and production rules.

A sample rule used in the system is:

if symptom = swollen_lymph_nodes and lesion_type = ulcerative then disease = epizootic_lymphangitis.

3.1. Scope

This study focuses on the systematic documentation, validation, and digitization of indigenous knowledge related to the diagnosis and treatment of fifteen major equine diseases in East Wallaga and Horo Guduru Wallaga Zones, Ethiopia. It involves key stakeholders such as traditional healers, horse owners, and veterinary professionals. The research develops a multilingual, rule-based knowledge-based system (KBS) implemented in SWI-Prolog to integrate traditional veterinary practices with modern diagnostic methods. Although the current system operates primarily online, with support for Afan Oromo, Amharic, and English languages, future work aims to extend its offline functionality and geographic reach to enhance accessibility and impact.

4. System Architecture

The system was implemented in SWI-Prolog and includes four key components: a knowledge base, an inference engine, a user interface, and an explanation facility. The knowledge base contains 120 validated rules covering 15 major equine diseases. The inference engine applies backward chaining to match user-input symptoms with likely diseases. A SQLite database stores multilingual terms in Afan Oromo, Amharic, and English, ensuring accessibility for diverse user groups. The web-based interface is optimized for desktop and mobile devices. System performance tests show an average response time of 1.2 seconds per query.

5. Results and Discussion

The developed KBS achieved an overall accuracy of 83% (95% CI: 79–87%), sensitivity of 81%, and specificity of 85%. User acceptance reached 83.4%, with positive feedback on the

system's ease of use and practical relevance. Comparative analysis revealed that the KBS significantly improved diagnostic accuracy compared to traditional healers' unaided assessments (67%). Challenges identified include limitations in language coverage and the absence of an offline mode for remote locations. Nonetheless, the system demonstrates significant potential to bridge healthcare gaps in rural equine management.

6. Conclusion and Future Work

This study validates the feasibility and benefits of integrating indigenous veterinary knowledge into a structured, AI-powered diagnostic system. By doing so, it preserves valuable cultural knowledge while enhancing veterinary service delivery. Future enhancements will focus on incorporating offline functionality, expanding the disease database to include donkeys and mules, and integrating environmental disease surveillance to improve prevention strategies.

Ethical and Practical Considerations

Ethical clearance and informed consent were obtained in accordance with Wallaga University policies and Ethiopian regulations. Benefit-sharing mechanisms are in place to ensure that knowledge holders receive recognition and appropriate compensation for their contributions. Documentation and system outputs will respect the intellectual property rights of indigenous communities.

Recommendations

- **Integrate Indigenous Knowledge into Formal Veterinary Practices:** Incorporate indigenous veterinary wisdom into veterinary education, training, and clinical protocols to enhance diagnostic accuracy and treatment efficacy through a culturally informed, holistic approach.
- **Enhance and Scale the Knowledge-Based System:** Further develop the KBS by expanding disease coverage, improving user interfaces, and enabling mobile and offline access to increase usability and reach, especially in remote rural areas.
- **Promote Stakeholder Engagement and Collaboration:** Foster active collaboration among local communities, veterinarians, policymakers, and NGOs to ensure the system's cultural appropriateness, acceptance, and sustainable deployment.

Diagnostic accuracy and user acceptance rates are summarized in **Table 1**.

Metric	Value (%)
Accuracy	83
Sensitivity	81
Specificity	85
User Acceptance	83.4

Table 1: Performance Metrics of The Developed Knowledge-Based System [5].

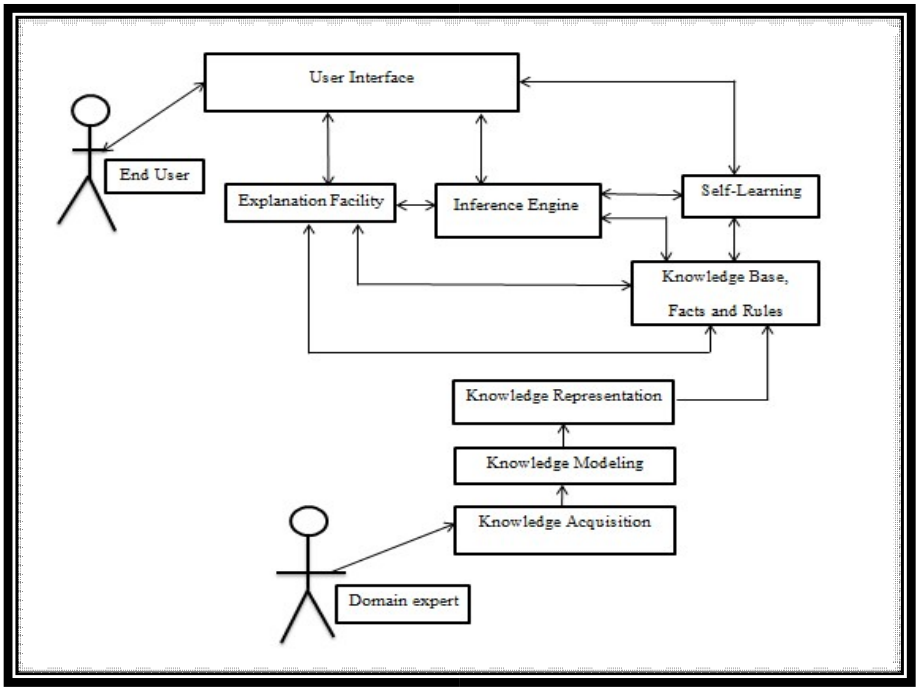

Figure 1: Architecture of the system

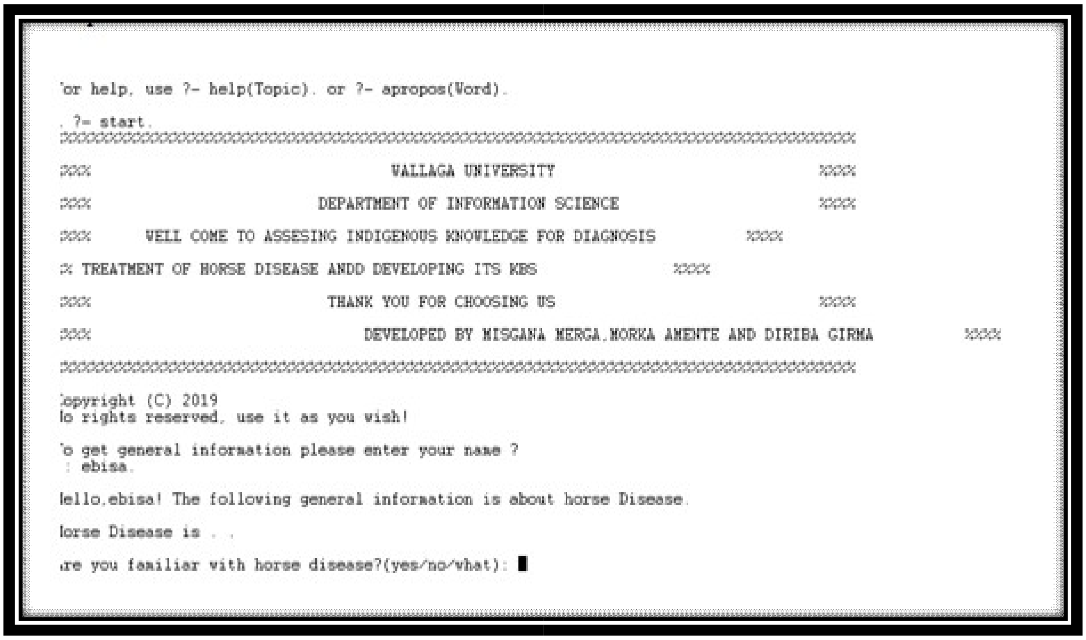

Figure 2: User Interface of the system

References

1. Yineger, H., Kelbessa, E., Bekele, T., & Lulekal, E. (2007). Ethnoveterinary medicinal plants at bale mountains national park, Ethiopia. *Journal of ethnopharmacology, 112*(1), 55-70.
2. Molla, B., Jember, T., Jemberu, W.T. (2021). Economic impact and knowledge of epizootic lymphangitis among horse owners in Ethiopia. *Preventive Veterinary Medicine, 191*, 105360.
3. Tesfaye, G., Belay, D. (2018). A self-learning expert system for chicken disease diagnosis. *Ethiopian Journal of Science and Technology, 11*(1), 30-40.
4. Siew, E.Y., Tan, T.W., Goh, A. (2005). Application of KBS in medical diagnosis: An overview. *International Journal of Medical Informatics, 74*(7-8), 545–552.
5. Sajja, P. S., & Akerkar, R. (2010). Knowledge-based systems for development. Advanced Knowledge Based Systems: Model, *Applications & Research, 1*, 1-11.